CLAIMS

What is Claimed is:

1. A method for initializing a communications receiver and increasing data throughput comprising:

receiving frames of data;

estimating values of taps of a frequency domain equalizer (FEQ) with an averaging technique that removes noise;

minimizing lengths of the taps using the data;

calculating values of the taps with the estimated values and an N Log N matrix using the data; and

generating an average of the frames of data.

2. The method of Claim 1, wherein estimating values of the taps with an averaging technique further comprises estimating values of taps by using an equation comprising:

$$y_i = \frac{1}{N_p} \sum_{j=1}^{N_p} y_i^{\,j}$$

where y is demodulated output, and N is a symbol size expressed in samples.

3. The method of Claim 1, wherein minimizing lengths of taps further comprises multiplying each row of the N Log N matrix with the pilot signal.

4. The method of Claim 1, wherein calculating values of the taps with an N Log N matrix and the data further comprises calculating values of the taps with a Toeplitz matrix having a structure of:

$$Y = \begin{bmatrix} y_{k \bullet s+v+1} & y_{k \bullet s+v} & \cdot & y_{k \bullet s+v-T+2} \\ y_{k \bullet s+v+2} & y_{k \bullet s+v+1} & \cdot & y_{k \bullet s+v-T+3} \\ \cdot & \cdot & \cdot & \cdot \\ y_{(k+1) \bullet s} & y_{(k+1) \bullet s-1} & \cdot & y_{k \bullet s+v-T+1} \end{bmatrix}$$

where Y is a (N x T) Toeplitz matrix of received signal samples, y is demodulated output, s = N+v and is a length of a symbol including prefix, N is a

symbol size expressed in samples, k is a time index, and v is a length of a cyclic prefix.

5. The method of Claim 1, wherein generating an average of the frames of data comprises:

$$F_i = \frac{1}{M_p}\sum_{j=1}^{M_p} F_i^{\,j}$$

where M is M is the number of tones according to the sub-channels, and F_N is an N by N FFT-matrix.

6. The method of Claim 1, further comprising storing a frame of data in the receiver comprising one or more symbols.

7. The method of Claim 1, further comprising applying a synchronization delay to the signal.

8. The method of Claim 1, further comprising aligning received frames of data based on the stored frame.

9. The method of Claim 1, further comprising resetting a frame counter.

10. The method of Claim 1, further comprising:

converting the training signal into parallel signals; and

removing a cyclic prefix from the parallel signals.

11. The method of Claim 1, further comprising transforming received parallel signals using a sliding discrete Fourier transform.

12. A communications receiver having computer-executable instructions for performing the steps recited in Claim 1.

13. A communications receiver comprising:

a T-tap time domain equalizer (TEQ) for shortening lengths of a channel input response of a received signal;

a frequency domain equalizer (FEQ) comprising N 1-tap filters for correcting a phase rotation and an amplitude attenuation of the received signal;

a processing unit;

a memory storage device; and

a program stored in the memory storage device for providing instructions to the processing unit; the processing unit responsive to the instructions of the program, operable for

estimating values of taps of a frequency domain equalizer (FEQ) with an averaging technique that removes noise;

minimizing lengths of the tap filters for the frequency domain equalizer (FEQ); and

calculating values of the taps with the estimated values and an N Log N matrix.

14. The receiver of Claim 13, wherein the processing unit is further operable for generating an average of received frames of data.

15. The receiver of Claim 13, wherein estimating values of the taps with an averaging technique further comprises estimating values of taps by using an equation comprising:

$$y_i = \frac{1}{N_p} \sum_{j=1}^{N_p} y_i^{\,j}$$

where y is demodulated output, and N is a symbol size expressed in samples.

16. The receiver of Claim 13, wherein calculating values of the taps with an N Log N matrix and the data further comprises calculating values of the taps with a Toeplitz matrix having a structure of:

$$Y = \begin{bmatrix} y_{k\bullet s+v+1} & y_{k\bullet s+v} & \cdot & y_{k\bullet s+v-T+2} \\ y_{k\bullet s+v+2} & y_{k\bullet s+v+1} & \cdot & y_{k\bullet s+v-T+3} \\ \cdot & \cdot & \cdot & \cdot \\ y_{(k+1)\bullet s} & y_{(k+1)\bullet s-1} & \cdot & y_{k\bullet s+v-T+1} \end{bmatrix}$$

where Y is a (N x T) Toeplitz matrix of received signal samples, s = N+v and is a length of a symbol including prefix, N is a symbol size expressed in samples, k is a time index, and v is a length of a cyclic prefix.